Botanical Gazette.

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EDITORIAL.—Now that the season for collection and observation is upon us, it seems appropriate to call the attention of botanists to the importance of systematic and recorded work. Many points of interest in systematic botany are still waiting to be settled, while observations in the department of physiology have been but begun. Elsewhere we have spoken of the great advantage of forming clubs for the better prosecution of this work, where such a thing is practicable. Of course some workers are necessarily isolated and must be carried through these labors by a pure love for them. But whenever a few can be brought together in a neighborhood and be induced to form a Botanical Club or a Natural History Society, the interest that will certainly be aroused and the enthusiasm with which observations and collections will be made will be productive of large results. There is a great deal of misdirected energy in botanical work, as well as in every other department of science. A man will collect, observe, record facts, spending much valuable time in getting together material that has already been collected, or is not important enough to justify the trouble. Magnifying small things is the great tendency in the amateur, who directs all his enthusiasm towards noting little distinctions and making them of such importance that he really cannot be made to realize that it all amounts to nothing. How many trivial letters from such misguided observers are sent annually to our leading botanists it would be hard to say. The worst of it is that these botanists are compelled to submit to such impositions in the hope of gleaning now and then a few grains of wheat from all this chaff. Now it is the tendency of botanical clubs to check such indiscriminate work. While through them the enthusiasm is greater, and interest in botany is rapidly disseminated, work can be better directed and made really valuable. Clubs can put themselves in communication with the best botanists, can become informed of the work that has already been done, and that is still waiting to be done. Members adding together their information will be surprised how they can act as checks upon each other. Persons desiring to form a club, but not having experience sufficient to know the best methods, have only to send to the Torrey Club of New York for a copy of the constitution and by-laws. Then when a club is formed, and the work begun, care should be taken not to be so wrapped up in self as not to let any one outside know what is being done. It has always seemed as if it should be one of the important duties of a club to publish what is worth publishing of its work. The simplest and most appropriate way for this to be done is for the secretaries of all botanical clubs to make it a part of their duties to send a synopsis of the proceedings of each meeting to the editor of the *Torrey Bulletin* or the editor of the BOTANICAL

GAZETTE, and let these gentlemen cull out what seems suitable for publication. This is given as a suggestion and from an earnest desire to reach in some way the good work that is being done and to turn into useful channels energies that are being wasted. We mention these two publications only, because they are the only ones entirely devoted to the interests of botanists. Other journals could be mentioned, but such notes as we speak of would not seem so fitting in them as more elaborate papers. There is good work enough to record to keep the *Torrey Bulletin* and the GAZETTE both busy in simply selecting the most important facts, and we hope that soon their pages will have to be increased in number to hold the notes which will come in on them like a flood.

GERMINATION AND GROWTH OF PARASITIC PLANTS.—Much interest has been manifested recently in regard to the germination of that class of plants which have heretofore been regarded as parasitics, and advocates are still found of both theories,—that they may germinate without attachment to a mother plant, and, that it is requisite for germination. Lindley says: "According to the observation of Vaucher of Geneva, the seeds of *Orobanche ramosa* will lie many years inert in the soil unless they come in contact with the roots of Hemp, the plant upon which that species grows parasitically, when they immediately sprout. Schlauter states that they only seize seedlings, and are unable to attach roots of stronger growths." In the summer of 1878, I collected in abundance near Haddonfield, New Jersey, *Orobanche minor*, (see BOTANICAL GAZETTE, Vol. 3, No. 9, September, 1878,) and as many of the specimens had ripe seeds I scattered them with a liberal hand over the grass plot and flower beds in the yard attached to my residence, hoping thereby for an opportunity to watch their development and growth; but as not a single specimen made its appearance during the following year, I had almost concluded my experiment a failure. A few days ago on going into my conservatory I was surprised to find I was there harboring three specimens, growing in the flower pots with Geraniums. These Geraniums had been transplanted from the conservatory to the yard in the summer of 1878 and hence were growing in the flower beds when the seeds of the Orobanche were scattered. In the fall of the same year they were retransplanted to the conservatory; the same process was repeated in the year 1879. One of the three specimens has been removed from the place of growth, and I have been unable to find an attachment to the roots of the Geraniums in any way, to either the main root or any of the smaller young fibrous roots, hence I am led to believe this plant at least has had an independent existence; the bulbous or enlarged base is much the same as that of the original specimens collected, but there are more fibrous roots attached, and they are more centrally fixed underneath, as may be seen in the growth of the common onion; the specimens heretofore examined had more of a side development, as though the attachment to the root of the parent plant had absorbed somewhat of the substance or caused an unequal growth.

Here we have two facts shown :—that the seeds of *Orobanche minor* may remain in the soil an indefinite time before germinating, and, that they do not require attachment in order to induce germination. As this species is parasitic on clover usually, and may have a preference for that, it is here shown that there may be a growth and full development without such service. One of these specimens measured 10 inches in height and had 45 flowers on it, with a large number of buds undeveloped at the top. I now have hopes that the coming season may give opportunity to watch their development still farther, as more of the seeds scattered in my yard may conclude, if they cannot find the proper foster parent, to grow without one.—ISAAC C. MARTINDALE, *Camden, New Jersey.*

SOME ARKANSAS FERNS.—*Cheilanthes lanuginosa*, Nutt., grows very abundantly upon limestone cliffs in the northwestern part of Arkansas. It can be found upon the escarpments of the wooded valleys that run inland from White river. I have found it inland two miles or more, and always on the north side of the valley in very dry situations, though it seems to like the shelter of projections. Its habitat is about the same as *Notholæna dealbata*, but I have never found them growing together. *Asplenium parvulum* is one of our common species in Arkansas. I have had this doubtful species under observation for several years, and have never been able to find intermediate forms or any reason for regarding it a variety of *A. ebeneum*. This species is found on dry ledges in this region, a situation in which I have never seen *A. ebeneum*. The latter is plentiful here but grows in rocky places in shaded woods. I have observed both species growing within a few feet of each other, in situations moist enough for both, and searched for intermediate forms but without success. Each retained its characteristics.

Cystopteris bulbifera, Bernh , is a common form in the northern part of Arkansas. Specimens from Benton county collected upon rocks in moist places measured nearly two feet long. The species mentioned above have never been reported from Arkansas, so far as I know. *Woodwardia angustifolia* may also be added, as I have seen specimens collected in the swamps of southern Arkansas.—F. L. HARVEY, *Ark. Ind. Univ., Fayetteville, Ark.*

FLORA OF KERGUELEN'S LAND.—The question is asked in the March number of the GAZETTE, whether the flora of Kerguelen's Land, "in which winged insects are either scarce or wanting," contains to any extent "flowers having showy petals or other properties attractive to winged insects." The elaborate recent memoir in the Transactions of the Royal Society, London, may answer the question. There are twenty-one indigenous phænogamous plants now known on Kerguelen's Land. Not one of them is showy flowered; of those that have petals at all the most conspicuous are the three species of *Ranunculus*, which in this respect are about equal to our *R. Cymbalaria*; the others are *Montia fontana*, *Tillæa moschata* and *Limosella aquatica*.—A. G.

EFFECTS OF UNINTERRUPTED SUNLIGHT ON PLANTS.—Dr. Schuebeler, of Christiana, has published in the Norwegian *Naturen* the results of some experiments on the acclimatization of southern plants in Sweden and Norway. His first experiments relate to the effect of the almost uninterrupted sun of Scandinavia on winter wheat. Samples from Bessarabia and Ohio sown showed in the first crop an increase in size and weight of grain, together with a deepened color. Increased development of the pigment of plants is shown also in the common garden flowers of central Europe, which when raised in Norway take on richer color. *Veronica serpyllifolia*, for example, changes from pale to deep blue, while *Trientalis Europœa*, naturally white, becomes decidedly pink. Under continuous sunlight also plants which usually fold their leaves at night, such as *Mimosa pudica*, kept them always open. It is also found that the aroma of fruits and vegetables is much increased. Some of the most savory of European garden vegetables when grown in Norway become absolutely disagreeable to the taste. This increase of aroma points to what may and ought to become a profitable industry in the Scandinavian peninsula, viz., the raising of those plants which are valuable for their yield of fixed and essential oils, inasmuch as the per cent. obtainable from a given weight is much increased by growth under these peculiar conditions. But while aroma, which seems thus dependent on light is much augmented, sweetness, depending on heat, is correspondingly lessened by moving northward. This is especially noticeable in small fruits, such as the strawberry, plum, cherry, etc. Dr. Schuebeler's experiments extended over 30 years and doubtless the full text of the communications would be most interesting.—C. R. B.

RED CALYX IN SAMBUCUS CANADENSIS, L.—As the botanizing season is again upon us it may be well to publish the following note of observations made last summer in this vicinity. By accident I found a bush of the common Elder in which every calyx was of an intense bright purplish-pink color, and this was true of all the flowers and unexpanded flower-buds on the whole plant. Pedicels and peduncles were the usual white, but all, including the calyx, were decidedly hirsute. A further examination proved that about one-fourth of all the shrubs in that patch had the calyx more or less tinted, there being about 30 in all. During the remainder of the summer I examined a great many plants and found the calyx more or less *colored* and *hirsute* in near one-third observed. In every instance where the calyx was tinted it was also hairy, but in two examples I found the calyx hairy but not tinted. The color was near that of red aniline. The plants that grew in rich alluvial soil appear to be most frequently colored.—J. SCHNECK, *Mt. Carmel, Ill.*

OBSERVATIONS ON REMARKABLE FORMS OF TRITICUM REPENS.—I am indebted to Wm. Boott, Esq., for the following: "In the English Flora Sir James Smythe says under *Triticum repens*, 'Schrader describes a remarkable state of this grass figured in Leen, t. 12, f. 4, 1,

in which a great part of the spikelets in the lower portion of the spike are double, or in pairs, contrary to the generic character.'" The above remarks were sent me by Mr. Boott, on seeing my lists of 1878 and 1879, which contain some remarkable forms of *Triticum repens*. No. 1578 (from Colorado) is characterized generally by involute, narrow, rigid, faintly nerved leaves, glumes and palets but slightly nerved, short awned. Some specimens have 9 joints to the rachis of spike, lowest joint with single spikelet (as in normal specimens of *T. repens*), the upper three the same, but all the rest with double spikelets at each joint. Another has 11 joints, lowest one double, all the rest single. From the same root is another stalk with 15 joints, lowest one single, next three double, rest single. Others have 13 joints, 7 double (always the lowest double unless stated otherwise); 18 joints, 8 double; 19 joints, 12 double; 22 joints, 15 double. From the same root as last is one with 22 joints, lowest single, next nine double. From Utah, under Nos. 1004a and 1516, are two very distinct forms, (1) the mountain form with broad, flat, green, nerved leaves; broad, acute, green, conspicuously nerved glumes and palets; (2) the form of the dry and heated valleys, with very long and narrow spikelets (over one inch long), whole plant glaucous; leaves rigid, involute, rather short, narrow; glumes and palets almost horny, smooth, scarcely nerved. Under (1), I have two specimens with 13 joints, lowest three triple spikeleted, rest double. Others have 10 to 15 joints, lowest one double, all the rest single. Others have 25 to 30 joints (very long spikes), lowest five double. Under (2), are some with about 18 joints, lower half all double. Others have 18 joints, all single but the third from the bottom, which is double. One other has 18 joints, lowest one double, next two single, next three double, the rest single.

I have many specimens of the most remarkable forms (besides those already sent out) as well as very many of these forms of *T. repens* with only single spikelets. I have shown the most remarkable forms to Dr. Vasey, who considers them remarkable forms of *T. repens*. These forms with double spikelets are not uncommon, for I have found them in many places in Colorado and Utah.

That the distinction of double spikelets in *Elymus* tends to be broken is shown in forms of *E. condensatus* and *triticoides* which often have the lowest joint single spikeleted, and the upper five also. Two or more single spikelets often occur in both the above and in *E. arenarius*, *Sibiricus* and occasionally in *E. Canadensis*.

In most of the eastern species, the glumes of *Elymus* form an apparent involucre, and to the amateur do not seem to be glumes, but in *Elymus arenarius*, L. and *condensatus*, Presl., in all the spikelets of the former and the upper ones of the latter, they are attached to the spikelets as closely as in *Triticum repens*, and more closely than in *T. violaceum*, especially the long awned form. A question asked by one of our leading botanists will find a good place here: "What is there to distinguish *Elymus Sibiricus* from *Triticum violaceum* but the double and single spikelets," and if these fail, what then?—MARCUS E. JONES.

SOME NOTES OF RARE FERNS.—On the trip to Ocala last December we noticed quantities of the beautiful *Aster Carolinianus*, full of large bright blossoms, growing all along the Ochlawaha river. About Ocala the flowers were scarce just then, but I gathered a large number of fine *Asplenium firmum*, two forms of *A. myriophyllum* and two forms of *Pteris Cretica*. When I saw the number of flourishing plants I had no fear of destroying localities, and was able to secure entire ferns for my specimens.

I was also successful in getting a goodly quantity of fruited *Polypodium Plumula* from a monster Live Oak in a deep forest near St. Augustine. This is the first time that I have collected this fern in really good condition. Though one of our prettiest ferns it gives more trouble in pressing than any other one, I think. This is caused by the extreme elasticity of the rhachis, which is so great that the frond *will not* stay as it is placed, and by the rolling up of the pinnæ. Unless placed in an extremely wet atmosphere they will not uncoil, and then they are all ready to curl right up again unless pressed at once. I have collected also excellent specimens of *Acrostichum aureum*. Some of these are simply upper sections of fruited fronds, and some show the entire fertile frond. The latter are five or six feet long and are very handsome ferns.—MARY C. REYNOLDS.

RHUS TOXICODENDRON.—I notice in the GAZETTE for October, 1879, an account of an unusually large specimen of *Rhus Toxicodendron*. As every botanist knows, this species is usually prostrate or creeping over walls and fences and at the north rarely high climbing, the stems seldom more than a half inch in diameter. It was with astonishment, therefore, that I noted during the winter of 1879 the enormous specimens among the timber along the Grand river in the Cherokee Nation. Many of them were not less than six inches in *diameter* and climbing to the tops of the tallest trees, thus rivaling *Tecoma radicans* and *Vitis*.

Here in Missouri the largest trees along the streams have been felled and most of the old specimens of the *Rhus* which clung to them been destroyed; still, very large specimens are frequent. I note that while *R. typhina* is the most abundant species in northern New England, *R. copallina* is largely in excess of the others here in the southwest.—WILLIAM F. FLINT, *Bowers Mills, Missouri.*

COMMELYNACEÆ.—At a meeting of the Linnean Society on Feb. 5, Mr. C. B. Clarke gave an oral *ré'sumé* of this order, which he had lately worked out for DeCandolle's "Prodromus." He defined the order by the position of the embryo, as not surrounded by albumen, but closely applied to the embryostega, which is always remote from the hilum. An important auxiliary character is that the three segments of the calyx are always imbricated, so that one is entirely outside of the two others. Mr. Clarke divides the *Commelynaceæ* into

three tribes, as follows: 1. *Polliceæ*, fruit indehiscent; 2. *Commelyneæ*, capsule loculicidal, fertile stamens 3–2; 3. *Tradescantieæ*, capsule loculicidal, fertile stamens 6–5. He also alluded to the manifest and important change of color in the petals of several of the *Commelynaceæ* – e. g., *Ancilema versicolor*, where from a bright yellow when fresh, they become a deep blue when dry.—*Nature.*

AUTOMATIC MOVEMENT OF THE FROND OF ASPLENIUM TRICHOMANES. – In a letter to Dr. Gray in reference to the above article in the March GAZETTE, Mr. E. J. Loomis says: The motion instead of being "in the plane of the frond," is really at right angles to it.

Four other fronds starting from two different roots exhibit motion, but in less degree than the one first noticed. These are not new fronds, but are old ones which were fully developed as to size when taken up, but have fruited since transplanting. It seems to me that the motion is confined, not only to the fruitful fronds, but to the period of fructification, since these four fronds have been subjected to the same condition as the first, but have exhibited motion only since fruiting began.

The stimulus of artificial light is sufficient to excite motion in the fronds for a few minutes, but after the lapse of five or six minutes the motion ceases and is not resumed.

I have noticed that the end of the frond does not describe a straight line but it moves in a long and very narrow ellipse, with the hands of a watch. The motion is more vigorous and through a larger arc in the middle of the day.

SOME FLORIDA FERNS FOR SALE. – Miss Mary Reynolds, of St. Augustine, Florida, has pressed beautiful specimens of some rare Florida ferns. She has a large number of duplicates for sale, and the low prices will enable every botanist interested in ferns to procure specimens. The species are *Asplenium firmum*, *A. myriophyllum*, *Pteris Cretica*, *Polypodium Plumula*, and *Acrostichum aureum*. The first four can be procured for fifteen cents each. Upper sections of the fertile frond of the *Acrostichum* cost from 20 to 60 cents; same with entire small sterile frond, 60 to 90 cents; entire fruited frond, one dollar.

NOTES FROM PAINESVILLE, OHIO. – Dr. H. C. Beardslee has sent specimens of *Scirpus atrovirens*, with the viviparous growth in two stages, one in which there are roots some inches in length. The specimens were on culms which had been broken over and were found lying in the water of a small brook.

Viviparous forms of *Cenchrus tribuloides* were also collected, a thing that might be expected in a plant of its habits.

Dr. Beardslee has also been watching the vegetation of the seeds of *Draba verna*, and the growth of the rosettes of radical leaves which it puts forth. This winter he watched it come into flower, which it did

as early as February 20. He thinks it clearly biennial and would be glad to know from other observers whether it is always so.

Sisymbrium Thaliana, a little later flowering than the *Draba*, is also biennial. In the first week of March it was just beginning to show flowers.

ERYTHRÆA CENTAURIUM.—In the summer of 1878 I discovered three or four fine plants of *Erythræa Centaurium*, Pers., nicely in blossom, on the grounds of the Agr'l Coll., Lansing, Mich. Some time before this Prof. Beal found specimens of the same in an open swamp near by. None have been found in the locality since '78.

Hydrocotyle umbellata, L., also occurs near here on the shores of small lakes.—L. H. BAILEY, JR.

SOME PLANTS OF FRANKLIN CO., KY.—For more than a year past I have been indebted to your GAZETTE for many little things of great interest to me, and I feel that I ought to make some return (or strive to do so) by giving you some of my notes on last year's collecting in this county (Franklin), premising, however, that I am a beginner in botany.

Hepatica triloba and *acutiloba* are both found on the Lower Silurian limestone hills or cliffs of Kentucky River, the latter species more common and often seen with the lateral lobes of the leaves again slightly lobed.

Isopyrum biternatum, T. & G., occurs in similar situations, but is more rare.

Hydrastis Canadensis, L., is common in rich woods and often has an additional leaf, three lobed, just below the flower, making three leaves on the stem.

Menispermum Canadense, L., is common, but it is rare to find a specimen with a woody stem nearly an inch in diameter.

Podophyllum peltatum, L., I found once with but one leaf on the flowering stem. I thought it rather interesting to find on one cliff at some distance from any dwelling three introduced plants, viz.: *Papaver somniferum*, L., *Bupleurum rotundifolium*, L., and *Vinca minor*. The latter covers a large portion of the wooded hill side, while the former grew scattered among the loose stones near the base. How the *Bupleurum* got there I cannot imagine, as I have never seen it anywhere else in the county.

Cardamine rhomboidea, var. *purpurea*, Torr., is common in rich soil at the base of the limestone cliffs.

Arabis patens, Sulliv. is found in the same situations, but is not common.

Vesicaria Shortii, T. & G., is quite abundant in a few localities in similar situations to the above.

Lepidium intermedium, Gray, is rare in dry woods.

Solea concolor, Ging, occurs abundantly in the rich soil on the river

cliffs, along with *Viola pubescens* and var. *scabriuscula*, T. & G. On wooded hill-sides, *Hypericum sphærocarpon*, Mx., occurs with *Tragia macrocarpa*, Willd., which last, according to Gray, has no stinging hairs; but they certainly made themselves felt on the back of my hands and wrists, while unable to penetrate the thicker epidermis of the fingers and palm.—R. H. WILDBERGER, *Ky. Mil. Institute, Farmdale, Ky.*

SYRACUSE BOTANICAL CLUB.—This active club does not confine its attention to field work, but has been busily employed all winter. They have held weekly meetings for the reading of papers on all the important orders of plants, illustrated by specimens collected the season before. Such a course has kept them very familiar with their local flora and we anticipate large results from it during the coming season. They will take the field thoroughly prepared by a season's experience in collecting and a winter of study, and our prophecy is that the summer of 1880 will bring to them richer results than that of 1879. Physiological botany has not been neglected for they have considered such subjects as "Perfume and Color" in plants, "Complementary Colors," "Motion in Plants" and "Insectivorous Plants."

We write this not so much for the encouragement of the club, for they do not need it, but to call attention to this most profitable way of studying botany where several persons interested in the science are within reaching distance of each other. One person working alone is apt to dissipate his energies over a very broad field and the result is small. But put several workers together and concentrate their work and it brings important results. The little things, which by themselves appear insignificant, when brought together, form an aggregate which is of great importance.

CURTISS' NORTH AMERICAN PLANTS.—There is no better collector of plants than Mr. A. H Curtiss, of Jacksonville, Fla. Not only does he succeed in collecting the rarest of species, but makes beautiful specimens, and to receive a bundle from him, with species carefully separated and labels handsomely printed, is a pleasure, the full enjoyment of which only a botanist can appreciate. Mr. Curtiss has just issued Fascicle III of his N. Am. Plants. In it are found 215 species and varieties, some 15 being supplementary to Fascicles I and II. The price of this Fascicle, at Cambridge, is eighteen dollars.

TORREY BULLETIN.—The February number is at hand, even handsomer and more attractive than the last. Putting in each month a short synopsis of the proceedings of the club is a good idea, for we all want to know what these clubs are talking about. In the proceedings of this month we notice a peculiar idea advanced by Dr. Jarvis in a paper on "Galls." The idea was not new to us, but its publicity was. It is that the gall insect is a product of the plant. It is contended

that galls are normal products of the plants on which they grow, and that these galls, by an evolution of their protoplasm, eventually give birth to animal life. This seems to "out-evolutionize" the most radical evolutionist.

Mr. Austin describes two new genera of mosses, dedicating one to Capt. J. Donnell Smith and the other to Mr. Eugene A. Rau. Considerable space is devoted to botanical news, a department that could be made exceedingly interesting and important in the organ of a large club so centrally located as the Torrey club. We note with pleasure that Mr. W. R. Gerard has been elected assistant editor of the Bulletin.

THE FUNCTION OF CHLOROPHYLL.—One of the most important recent contributions to physiological botany is contained in a recent communication to the Berlin Academy of Sciences, by Dr. Pringsheim, which appears to throw considerable fresh light on the function of chlorophyll in the life of the plant.

Having been led by previous researches to the conclusion that important results might be obtained by the use of intense light, he combined an apparatus by which the object under view should be brightly and constantly illuminated by a strong lens and a heliostat. If in this way an object containing chlorophyll —a moss-leaf, fern-prothalium, chara, conferva, or thin section of a leaf of a phanerogam be observed, it is seen that great changes are produced in a period varying from three to six or more minutes.

The first and most striking result is the complete decomposition of the chlorophyll, so that in a few minutes the object appears as if it had been lying for some days in strong alcohol. Although, however, the green color has disappeared, the corpuscles retain their structure essentially unaltered. The change then gradually extends to the other constituents of the cell; the circulation of the protoplasm is arrested; the threads of protoplasm are ruptured and the nucleus displaced; the primordial utricle contracts and becomes permeable to coloring matters; the turgidity of the cell ceases; and the cell presents, in short, all the phenomena of death.

That these effects are not due to the action of the high temperature to which the cell is exposed under these circumstances is shown by the fact that they are produced by all the different parts of the visible spectrum. The result is the same whether the light has previously passed through a red solution of iodine in carbon bisulphide, through a blue ammoniacal solution of cupric oxide, or through a green solution of cupric chloride. If the carbon bisulphide solution of iodine be so concentrated that only rays of a greater wave-length than 0.00061 mm. can pass through it, these effects are not produced, although about eighty per cent. of the heat of white sunlight is transmitted. On the other hand, if the ammoniacal solution of cupric oxide be so concentrated that the whole of the rays of a less wave-length than 0.00051 mm. are absorbed, a rapid and powerful effect is pro-

duced, although the amount of heat that passes is very small. It is thus seen that the phenomena in question are not the result of heat.

The next point determined by Dr. Pringsheim is that the effects are not produced in an atmosphere devoid of oxygen. This was the case whether the oxygen was replaced by pure hydrogen or by a mixture of hydrogen and carbon dioxide; while the removal of the carbon dioxide from atmospheric air was altogether without effect on the phenomena. The conclusion drawn is that the decomposition of chlorophyll in the living plants is a process of combustion which is influenced and promoted by the action of light, and which is not related to the decomposition of carbon dioxide by the plant. When the green color of the chlorophyll-grains has been partially destroyed, it cannot be restored, even though the cell continues to live; from which it is inferred that the result is not a normal physiological, but a pathological effect. No substance was found in the cells which might be regarded as the product of the decomposition of the chlorophyll, nor was any oil or starch detected in the etiolated cell, nor any formation of grape-sugar or dextrine. The assumption is therefore that the products of decomposition are given off in the gaseous form.

The conclusion is drawn that the decomposition produced in the protoplasm, and in the other colorless cell contents, is the direct effect of the photochemical action of light. That it is not due to the injurious influence of the products of decomposition of the coloring matter of the chlorophyll is shown by the fact that it takes place equally in cells destitute of chlorophyll, such as the hairs on the filaments of *Tradescantia*, the stinging hairs of the nettle, &c. It is, on the other hand, dependent on the presence of the oxygen, or is a phenomenon of combustion.

The results of a variety of experiments leads Dr. Pringsheim to the important and interesting conclusion that the chlorophyll acts as a protective substance to the protoplasm against the injurious influence of light, diminishing the amount of combustion, or, in other words, acting as a regulator of respiration.

He then proceeds to investigate what are the substances which become oxidized in the process of respiration. In every cell, without exception, that contains chlorophyll, Pringsheim finds a substance that can be extracted by immersion in dilute hydrochloric acid for from twelve to twenty-four hours, to which he gives the name *hypochlorin* or *hypochromyl*, and which he believes to be the primary product of the assimilation of the chlorophyll. It occurs in the form of minute viscid drops or masses of a semi-fluid consistency, which gradually change into long red-brown imperfectly crystalline needles. It is soluble in alcohol, ether, turpentine and benzol, but insoluble in water and in a solution of sodium chloride. It becomes gradually oxidized on exposure to an imperfectly crystalline resinous substance. It is probably an ethereal oil, and an invariable accompaniment of the coloring substance of chlorophyll, and even more universally distributed than starch or oil. It has not yet been detected in those plants which

do not contain true green chlorophyll, such as the Phycochromaceæ, Diatomaceæ, Fucaceæ and Florideæ. Starch and oil appear to be reserve substances produced by the oxidization of the hypochlorin caused by light, it being the most readily oxidizable constituent of the cell, more so even than chlorophyll itself.

That the hypochlorin—present in variable quantity in every chlorophyll grain under normal circumstances—is subject to continual increase and decrease, may be proved without difficulty. All comparative observations on chlorophyll grains in younger and in older conditions, point unmistakably to the conclusion that the collection and increase of the starch enclosed in the ground substance of the chlorophyll, goes on *pari passu* with the decrease of the hypochlorin. In dark, the hypochlorin, which does not take any direct part in transport of food materials, is more permanent than starch; and this fact again is in agreement with the conclusion that its transformation in the cell into more highly oxidized bodies is hindered by the increased respiration in light.

In the facts here detailed, and the conclusions derived from them, Dr. Pringsheim believes that an entirely new light is thrown on the cause of the well-known fact that assimilation takes place only in those cells of the plant which contain chlorophyll. This substance acts universally as a moderator of respiration by its absorptive influence on light, and hence allows the opposite phenomena of respiration and elimination of carbon dioxide to go on in those cells which contain it. A more detailed account of the experiments and results is promised by the author in a future paper.—ALFRED W. BENNETT, *in Am. Naturalist.*

PTERIS AQUILINA, VAR CAUDATA, AGAIN.—Since my note in the GAZETTE on the huge specimen of this species sent from Florida, I have received the following note from Mr. White: "In compliance with your request I measured a *Pteris* as follows: Stipe 6 ft.; first pair of divisions abortive; second pair 8 ft. from ground, and each division 5 ft. (making a spread of 10 ft., G. E. D.); third pair, spread 8 ft. and the next pair 6 ft.: total height 14½ ft. The primary divisions were 2 ft. apart until the last mentioned pair which were 1½ ft., making a spread of 6 ft. at a height of 11½ ft. from the ground. Almost aborescent, eh?"

It will be seen from this that I probably underestimated the breadth of the specimen which I described, and that the dimensions of the specimens measured by Mr. White exceed anything heretofore recorded anywhere.—GEO. E. DAVENPORT.

AMERICAN MONTHLY MICROSCOPICAL JOURNAL.—This a continuation of the *Quarterly* and is worthy the support of all interested in the work of the microscope. It is a journal of 20 pages, is illustrated, and costs but one dollar per year. The name of the editor, Romyn Hitchcock, gives an assurance of careful. conscientious work.